

REMARKS

The Examiner objected to disclosure. In response, applicants have amended the specification as suggested by the Examiner.

The Examiner objected to claims 1, 2, 6, 7, 14, 15, 21 and 22. In response, applicants have amended claims 1, 2, 6, 7, 14, 15, 21 and 22 as suggested by the Examiner.

The Examiner rejected claims 17-20, 22 and 24-27 under 35 U.S.C. § 102(b) as allegedly being anticipated by Wong (U.S. 6,340,556).

The Examiner rejected claims 1-5 and 8 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Wong (U.S. 6,340,556) in view of Marella (U.S. 2003/0139838).

The Examiner rejected claim 6 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Wong (U.S. 6,340,556) in view of Marella (U.S. 2003/0139838) as applied to claim 1 above, and further in view of Cowan (U.S. 6,605,951).

The Examiner rejected claims 10-13 and 15 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Wong (U.S. 6,340,556) in view of Wolf *et al.* (*Silicon Processing for the VLSI Era*, Vol. 1, 2000).

The Examiner rejected claims 7 and 9 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Wong (U.S. 6,340,556) in view of Marella (U.S. 2003/0139838), as applied to claim 1 above, and further in view of Ghandhi (*VLSI Fabrication Principles - Silicon and Gallium Arsenide, Second Edition*, 1994).

The Examiner rejected claims 14 and 16 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Wong (U.S. 6,340,556) in view of Wolf *et al.* (*Silicon Processing for the VLSI Era*, Vol. 1, 2000) as applied to claims 10 and 15 above, and further in view of Ghandi (*VLSI*

Fabrication Principles - Silicon and Gallium Arsenide. Second Edition, 1994).

The Examiner rejected claims 21 and 23 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Wong (U.S. 6,340,556) in view of Ghandi (*VLSI Fabrication Principles - Silicon and Gallium Arsenide*, Second Edition, 1994).

Applicants respectfully traverse the § 102 and § 103 rejections with the following arguments.

35 U.S.C. § 102(b)

Claims 17-20, 22 and 24-27 are rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Wong (U.S. 6,340,556).

Claims 17-20, 22, and 24-27

Applicants respectfully contend that Wong does not anticipate claims 17 and 24 as amended, because Wong does not teach each and every feature of claims 17 and 24.

For example, Wong does not teach the feature of “forming a plurality of features in the photoresist layer; measuring a plurality of critical dimensions...to determine at least one critical dimension error...correcting the at least one critical dimension error by **selectively exposing only** the at least one feature comprising the critical dimension error to an electron beam comprising said determined dose of electron beam exposure that corrects the critical dimension error of the at least one feature” (emphasis added).

The Examiner alleges that “ Regarding claim 17, Wong teaches a method, comprising: providing a semiconductor structure, wherein the semiconductor structure comprises a photoresist layer on a semiconductor substrate (column 6, lines 23-25); forming a plurality of features in the photoresist layer (column 8, lines 7-10); measuring a plurality of critical dimensions of the plurality of features to determine at least one critical dimension error for at least one feature of the plurality of features (column 9, lines 33-38); determining from said at least one critical dimension error a dose of electron beam exposure to correct the at least one critical dimension error for the at least one feature of the plurality of features (column 8, lines 14-67); and

correcting the at least one critical dimension error by exposing the at least one feature comprising the critical dimension error to an electron beam comprising said determined dose of electron beam exposure that corrects the critical dimension error of the at least one feature (column 8, lines 14-67) ”.

In response, Applicants respectfully contend that Wong does not teach that **only** at least one feature (i.e., formed in a photoresist layer) comprising a critical dimension error is **selectively exposed** to an electron beam that corrects the critical dimension error as taught by Applicant's claims 17 and 24. In contrast, Wong teaches in col. 8, lines 18-22 that “ The electron beam irradiating is conducted with a uniform, large-area, overall electron beam exposure source which **simultaneously** exposes substantially **all of the image areas** of the photosensitive composition **simultaneously**”. Wong further teaches in Col. 8, lines 52-54 “ the electron beam exposing step is conducted with a wide, large beam of electron beam radiation from a uniform large-area electron beam source which **simultaneously covers the entire substrate** ” Therefore, Applicants contend that Wong teaches a process for exposing an **entire substrate** comprising a plurality of photoresist lines (photo resist lines exposed simultaneously) to electron beam radiation. Applicants argue that Wong does not teach **selectively exposing only** a photoresist feature(s) (i.e., comprising a critical dimension error(s)) to an electron beam as taught by Applicant's claims 17 and 24. Based on the preceding arguments, Applicants respectfully maintain that Wong does not anticipate claims 17 and 24 and that claims 17 and 24 are in condition for allowance. Since claims 18-20 and 22 depend from claim 17 and claims 25-27 depend from claim 24, Applicants contend that claims 18-20, 22 and 25-27 are likewise in condition for allowance.

Claims 20 and 27

Applicants respectfully contend that Wong does not anticipate claims 20 and 27 as amended, because Wong does not teach each and every feature of claims 17 and 24.

For example, Wong does not teach the feature of “providing a **graphical** relationship between a changing of critical dimension size changes and dosage of electron beam exposure; and choosing the dose of electron beam exposure for a desired size change in critical dimension size, said **choosing** being based on said **graphical** relationship” (emphasis added).

The Examiner alleges that “Regarding claims 20 and 27, Wong teaches the method of claims 17 and 24, and further teaches that determining the dose of electron beam exposure comprises providing a relationship between a changing of critical dimension size changes and dosage of electron beam exposure; and choosing the dose of the electron beam exposure for a desired change in critical dimension size, said choosing being based on said relationship (column 8, lines 11-67; column 9, lines 32-40) ”.

In response, Applicants respectfully contend that Wong does not teach providing a **graphical** relationship between critical dimension size changes and a dosage of electron beam exposure to choose a dose of the electron beam exposure as taught by Applicant’s claims 20 and 27. In contrast, Wong teaches a selection of electron beam exposure conditions but does not specify how the conditions are selected. Therefore, Applicants contend that Wong does not teach choosing a dose of the electron beam exposure based on a **graphical** relationship between critical dimension size changes and a dosage of electron beam exposure as taught by Applicant’s claims 20 and 27. Based on the preceding arguments, Applicants respectfully maintain that Wong does not anticipate claims 20 and 27 and that claims 20 and 27 are in condition for

allowance.

35 U.S.C. § 103(a)

Claims 1-5 and 8

Claims 1-5 and 8 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Wong (U.S. 6,340,556) in view of Marella (U.S. 2003/0139838).

Applicants respectfully contend that claim 1 as amended is not unpatentable over Wong in view of Marella, because Wong and Marella do not teach or suggest each and every feature of claim 1.

For example, Wong and Marella do not teach or suggest the feature of “forming a plurality of features in the photoresist layer; measuring a plurality of critical dimensions...to determine at least one critical dimension error...correcting the at least one critical dimension error by **selectively exposing only** the at least one feature comprising the critical dimension error to an electron beam comprising said determined dose of electron beam exposure that corrects the critical dimension error of the at least one feature” (emphasis added).

The Examiner alleges that “providing a first semiconductor device; analyzing the first semiconductor device to determine at least one critical dimension error within the first semiconductor device (column 9, lines 33-38); determining from said at least one critical dimension error a dose of electron-beam exposure to correct the at least one critical dimension error in a process (column 8, lines 14-67), comprising:

providing a semiconductor structure, wherein the semiconductor structure comprises a photoresist layer on a semiconductor substrate (column 6, lines 23-25); forming a plurality of features in the photoresist layer (column 8, lines 7-10), wherein at

least one feature of the plurality of features comprises the at least one critical dimension error; and

correcting the at least one critical dimension error by exposing the at least one feature comprising the critical dimension error to an electron beam comprising said determined dose of electron beam exposure (column 8, lines 14-67)”.

The Examiner further alleges that “Marella teaches a method of analyzing a first semiconductor device to determine at least one critical dimension error (paragraph 0033 teaches that one of the defects”.

In response, Applicants respectfully contend that Wong and Marella do not individually or in combination teach or suggest that **only** at least one feature (i.e., formed in a photoresist layer) comprising a critical dimension error is **selectively exposed** to an electron beam that corrects the critical dimension error as taught by Applicant's claim 1. In contrast, Wong teaches in col. 8, lines 18-22 that “The electron beam irradiating is conducted with a uniform, large-area, overall electron beam exposure source which **simultaneously** exposes substantially **all of the image areas** of the photosensitive composition **simultaneously**”. Wong further teaches in Col. 8, lines 52-54 “the electron beam exposing step is conducted with a wide, large beam of electron beam radiation from a uniform large-area electron beam source which **simultaneously covers the entire substrate** ”. Applicants contend that Wong teaches a process for exposing an **entire substrate** comprising a plurality of photoresist lines (photo resist lines exposed simultaneously) to electron beam radiation. Applicants further contend that Marella merely teaches repairing defects on a specimen. Therefore, Applicants argue that Wong and Marella do not teach **selectively exposing only** a photoresist feature(s) (i.e., comprising a critical dimension error(s))

to an electron beam as taught by Applicant's claim 1. Based on the preceding arguments, Applicants respectfully maintain that claim 1 is not unpatentable over Wong in view of Marella, and that claim 1 is in condition for allowance. Since claims 2-5 and 8 depend from claim 1, Applicants contend that claims 2-5 and 8 are likewise in condition for allowance.

Claim 4

Applicants respectfully contend that that claim 4 as amended is not unpatentable over Wong in view of Marella, because Wong and Marella do not teach or suggest each and every feature of claim 4.

For example, Wong and Marella do not teach or suggest the feature of “providing a **graphical** relationship between a changing of critical dimension size changes and dosage of electron beam exposure; and choosing the dose of electron beam exposure for a desired size change in critical dimension size, said **choosing** being based on said **graphical** relationship” (emphasis added).

The Examiner alleges that “Regarding claim 4, Wong and Marella together teach the method of claim 1. Wong further teaches that determining the dose of electron beam exposure comprises providing a relation ship between a changing of critical dimension size changes and dosage of electron beam exposure; and choosing the dose of the electron beam exposure for a desired change in critical dimension size, said choosing being based on said relationship (column 8, lines 11-67; column 9, lines 32-40) ”.

In response, Applicants respectfully contend that Wong and Marella do not teach or suggest providing a **graphical** relationship between critical dimension size changes and a dosage

of electron beam exposure to choose a dose of the electron beam exposure as taught by Applicant's claim 4. In contrast, Wong teaches a selection of electron beam exposure conditions but does not specify how the conditions are selected. Therefore, Applicants contend that Wong and Marella do not teach or suggest choosing a dose of the electron beam exposure based on a **graphical** relationship between critical dimension size changes and a dosage of electron beam exposure as taught by Applicant's claim 4. Based on the preceding arguments, Applicants respectfully maintain that Wong and Marella do not teach or suggest claim 4 and that claim 4 is in condition for allowance.

Claim 6

Claim 6 is rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Wong (U.S. 6,340,556) in view of Marella (U.S. 2003/0139838) as applied to claim 1 above, and further in view of Cowan (U.S. 6,605,951).

In response, Applicants contend that since claim 6 depends from claim 1 which Applicants have argued *supra* to not be unpatentable over Wong in view of Marella under 35 U.S.C. §103(a), Applicants maintain that claim 6 is likewise not unpatentable Wong in view of Marella and further in view of Cowan under 35 U.S.C. §103(a).

Claims 10-13 and 15

Claims 10-13 and 15 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Wong (U.S. 6,340,556) in view of Wolf *et al.* (*Silicon Processing for the VLSI Era*, Vol. 1, 2000).

Applicants respectfully contend that claim 10 as amended is not unpatentable over Wong in view of Wolf, because Wong and Wolf do not teach or suggest each and every feature of claim 10.

For example, Wong and Wolf do not teach or suggest the feature of “forming a plurality of features in the photoresist layer; measuring a plurality of critical dimensions...to determine at least one critical dimension error...correcting the at least one critical dimension error by **selectively exposing only** the at least one feature comprising the critical dimension error to an electron beam comprising said determined dose of electron beam exposure that corrects the critical dimension error of the at least one feature” (emphasis added).

The Examiner alleges that “ Regarding claim 10, Wong teaches a method, comprising: providing a semiconductor structure, wherein the semiconductor structure comprises a photoresist layer on a semiconductor substrate (column 6, lines 23-25); propagating radiation to expose the photoresist layer to form a plurality of features in the photoresist layer (column 7, lines 5-7), and then measuringon the substrate a plurality of critical dimensions within the pattern to determine at least one critical dimension error within said pattern (column 9, lines 33-38); determining from said at least one critical dimension error a dose of electron-beam exposure that will be used to correct the at least one criticaldimension error for the at least one feature comprising the at least one critical dimension error (column 8, lines 14-67); and correcting the critical dimension error by exposing the at least one feature comprising the critical dimension error to an electron beam comprising said determined dose of electron-beam exposure that corrects the critical

dimension error of the at least one feature (column 8, lines 14-67).

Wong does not teach using a mask to pattern the photoresist layer or measuring on the mask the plurality of critical dimension errors.

Wolf et al. teaches that it common to expose photoresist through a mask to pattern the photoresist (p. 489, first paragraph) ”.

In response, Applicants respectfully contend that Wong and Wolf do not individually or in combination teach or suggest that **only** at least one feature (i.e., formed in a photoresist layer) comprising a critical dimension error is **selectively exposed** to an electron beam that corrects the critical dimension error as taught by Applicant's claim 10. In contrast, Wong teaches in col. 8, lines 18-22 that “ The electron beam irradiating is conducted with a uniform, large-area, overall electron beam exposure source which **simultaneously** exposes substantially **all of the image areas** of the photosensitive composition **simultaneously**”. Wong further teaches in Col. 8, lines 52-54 “ the electron beam exposing step is conducted with a wide, large beam of electron beam radiation from a uniform large-area electron beam source which **simultaneously covers the entire substrate** ” Applicants contend that Wong teaches a process for exposing an **entire substrate** comprising a plurality of photoresist lines (photo resist lines exposed simultaneously) to electron beam radiation. Applicants further contend that Wolf mearly teaches exposing a photoresist using a mask. Therefore, Applicants argue that Wong and Wolfdo not teach **selectively exposing only** a photoresist feature(s) (i.e., comprising a critical dimension error(s)) to an electron beam as taught by Applicant's claim 10. Based on the preceding arguments, Applicants respectfully maintain that claim 10 is not unpatentable over Wong in view of Wolf, and that claim 10 is in condition for allowance. Since claims 11-13 and 15 depend from claim

10, Applicants contend that claims 11-13 and 15 are likewise in condition for allowance.

Claim 13

Applicants respectfully contend that that claim 13 as amended is not unpatentable over Wong in view of Wolf, because Wong and Wolf do not teach or suggest each and every feature of claim 13.

For example, Wong and Wolf do not teach or suggest the feature of “providing a **graphical** relationship between a changing of critical dimension size changes and dosage of electron beam exposure; and choosing the dose of electron beam exposure for a desired size change in critical dimension size, said **choosing** being based on said **graphical** relationship” (emphasis added).

The Examiner alleges that “Regarding claim 13, Wong and Wolf et al. together teach the method of claim 10. Wong further teaches that determining the dose of electron beam exposure comprises providing a relation ship between a changing of critical dimension size changes and dosage of electron beam exposure; and choosing the dose of the electron beam exposure for a desired change in critical dimension size, said choosing being based on said relationship (column 8, lines 11-67; column 9, lines 32-40) ”.

In response, Applicants respectfully contend that Wong and Wolf do not teach or suggest providing a **graphical** relationship between critical dimension size changes and a dosage of electron beam exposure to choose a dose of the electron beam exposure as taught by Applicant’s claim 13. In contrast, Wong teaches a selection of electron beam exposure conditions but does not specify how the conditions are selected. Therefore, Applicants contend

that Wong and Wolf do not teach or suggest choosing a dose of the electron beam exposure based on a **graphical** relationship between critical dimension size changes and a dosage of electron beam exposure as taught by Applicant's claim 13. Based on the preceding arguments, Applicants respectfully maintain that Wong and Wolf do not teach or suggest claim 13 and that claim 13 is in condition for allowance.

Claims 7 and 9

Claims 7 and 9 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Wong (U.S. 6,340,556) in view of Marella (U.S. 2003/0139838), as applied to claim 1 above, and further in view of Ghandhi (*VLSI Fabrication Principles - Silicon and Gallium Arsenide, Second Edition*, 1994).

In response, Applicants contend that since claims 7 and 9 depend from claim 1 which Applicants have argued *supra* to not be unpatentable over Wong in view of Marella under 35 U.S.C. §103(a), Applicants maintain that claims 7 and 9 are likewise not unpatentable Wong in view of Marella and further in view and further in view of Ghandhi under 35 U.S.C. §103(a).

Claims 14 and 16

Claims 14 and 16 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Wong (U.S. 6,340,556) in view of Wolf *et al.* (*Silicon Processing for the VLSI Era*, Vol. 1, 2000) as applied to claims 10 and 15 above, and further in view of Ghandhi (*VLSI Fabrication Principles - Silicon and Gallium Arsenide*. Second Edition, 1994).

In response, Applicants contend that since claims 14 and 16 depend from claim 10 which

Applicants have argued *supra* to not be unpatentable over Wong in view of Wolf under 35 U.S.C. §103(a), Applicants maintain that claims 14 and 16 are likewise not unpatentable Wong in view of Wolf and further in view of Ghandi under 35 U.S.C. §103(a).

Claims 21 and 23

Claims 21 and 23 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Wong (U.S. 6,340,556) in view of Ghandi (*VLSI Fabrication Principles - Silicon and Gallium Arsenide*, Second Edition, 1994).

In response, Applicants contend that since claims 21 and 23 depend from claim 17 which Applicants have argued *supra* to not be anticipated by Wong under 35 U.S.C. §102(b), Applicants maintain that claims 21 and 23 are likewise not unpatentable over Wong in view of Ghandi under 35 U.S.C. §103(a).

CONCLUSION

Based on the preceding arguments, Applicants respectfully believe that all pending claims and the entire application meet the acceptance criteria for allowance and therefore request favorable action. If the Examiner believes that anything further would be helpful to place the application in better condition for allowance, Applicants invites the Examiner to contact Applicants' representative at the telephone number listed below. The Director is hereby authorized to charge and/or credit Deposit Account 09-0456.

Date: 6/26/06



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